

Callable Agencies November 2006

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- Callable Analysis
- Interpreting the AOAS screen
- Comparison of Callable Bonds Strategies

What are callable agencies?

- The purchaser of a callable agency is long a bullet position and short an option position.

$$\begin{array}{ccccc} \text{Callable} & & \text{Bullet} & & \text{Call Option} \\ \text{Bond Price} & = & \text{Price} & - & \text{Price} \end{array}$$

- The issuer will call the bond when the coupon of a new bond is lower than the coupon rate they are paying on the outstanding issue.
- The investor is compensated for selling the call option in the form of incremental yield pickup over bullets.

Why do the agencies issue callables?

- Fund the purchase of MBS and hedge the interest rate risk of the MBS portfolio.
 - Callables allow the agencies to better match the duration of assets (mortgages) and liabilities (debt instruments). FNMA and FHLMC typically retain the optionality in their callable debt to offset the optionality in their MBS portfolios.
 - Callable debt allows the agencies to refinance debt as interest rates decline. This occurs at the same time that homeowners refinance mortgages.
- FHLB issues debt to provide advances to member banks for home mortgages and purchase mortgages. FHLB typically swaps issuance into floating and sells the optionality in callable debt.
- Gross Callable Issuance through 9/30/06 (\$billion)
 - FNMA \$87.3
 - FHLMC \$81.6
 - FHLB \$94.5

Agency Callable Bond Terminology

2 yr agency not callable for 1yr and callable one time only.

2 NC 1-year 1x

Final Maturity

Lockout

Call Type

1-30 yr

1 mo to 5 yr

1x, s/a, Qrtly,
Monthly, Cont

Callable Frequency

- European: One Time
- Bermuda: Semiannual or Quarterly
- Canary: Combination of Bermudan and European
- American: Continuous

Callable Terminology

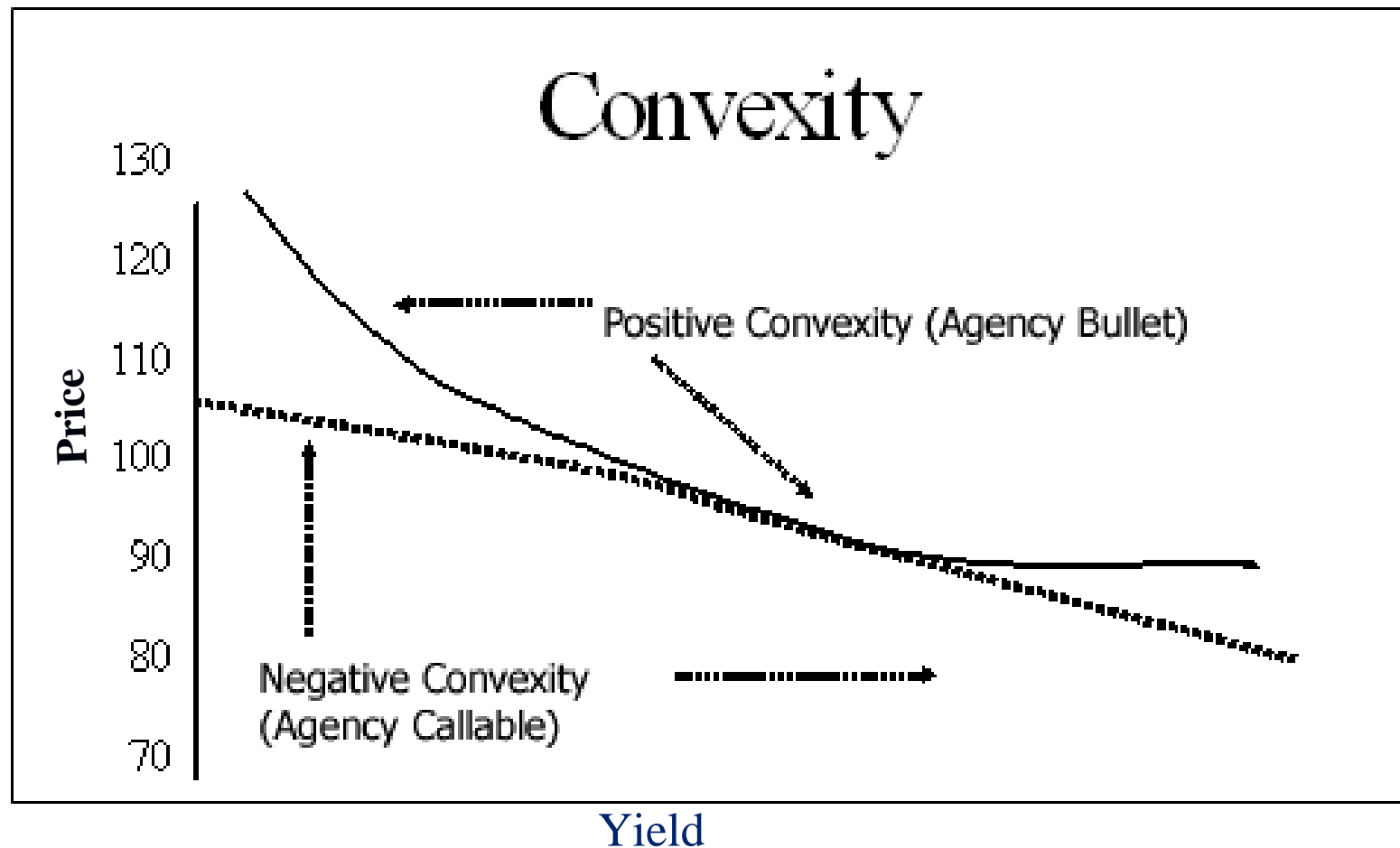
■ Duration

- Measures the approximate price impact for a change in interest rates.
- For example, the price of a bond with a duration of 3 will fall by approximately 3% when interest rates increase by a 100 bp.
- Effective duration takes into account that expected cash flows will fluctuate as interest rates change.

■ Negative Convexity

- Measures the rate of change of duration as bond prices change.
 - When interest rates fall, the price of a negatively convex will fall by more than that of a positively convex bond.
 - When interest rates rise, the price of a negatively convex bond will rise by less than that of a positively convex bond.

Graph Negative Convexity



Impact of Negative Convexity

	3 NC6M (Qrtly)	3yr Bullet
Price	100	97.93
Effective Duration	0.95	0.94
Effective Convexity	-1.17	0.01
- 100 bp Change in Rates %Change in Price	0.60	0.95
+100 bp Change in % Change in Price	-1.56	-0.94
Impact of negative convexity	When rates rise, the price falls by <u>more</u> than implied by duration. When rates fall, the price increases by <u>less</u> than implied by duration.	When rates rise, the price falls by <u>less</u> than implied by duration. When rates fall, the price increases by <u>more</u> than implied by duration.

Callable Analysis

- How much extra yield am I earning versus buying a non callable? How does this compare with historicals?
- How much extra yield am I getting paid for added optionality in the form of shorter lockout and increased call frequency? What is the likelihood of call?
- What is the reinvestment risk? Determine how much rates can fall before you would have been better off having bought the bullet.
- What is the extension risk? Determine how much rates can rise before you would have been better off staying short and waiting for higher rates to extend.
- How does this compare with interest rate expectations?

Yield Enhancement: Call Frequency

- The pick up for moving from a 1x to semiannual or quarterly call is near the 3M average.
 - 3NC3M (Qrlty) picks up 23 bp to the 3NC3M (1x) vs. a 3M avg of 24 bp.
 - The quarterly call has 11 options versus 1 option in the 1x.
- The call frequency decision will depend on your view of rates. The market is currently pricing in falling rates, which would result in all structures getting called.
 - In this case, you would maximize the YTC in the form of Berms to offset some of the reinvestment risk.
 - If rates are expected to fall by more than the minimum breakeven rate, then a bullet would be the better buy.
 - If rate rise enough for 1xs and Berms not to be called, yield buyers will prefer the higher coupon of the Berms. TRR buyers will prefer the 1xs as the spread compresses toward the bullet curve.

Callable Agencies vs. Par Agy												Berms Less Euros							
Euros	Cpn	Last	1Mo Chg	3M Avg	Z	Berms	Cpn	Last	1Mo Chg	3M Avg	Z	Cpn Diff	1 Day Chg	1 Wk Chg	1Mo Chg	3M High	3M Low	3M Avg	Z
2NC3M	5.23	0.26	-0.02	0.21	1.02	2NC3M	5.32	0.35	-0.03	0.31	0.81	0.09	0.00	0.00	-0.01	0.12	0.08	0.10	-1.04
2NC6M	5.25	0.28	-0.02	0.24	0.90	2NC6M	5.31	0.34	-0.02	0.30	1.04	0.06	0.01	0.01	0.00	0.06	0.04	0.05	0.86
2NC1Y	5.22	0.25	0.00	0.20	1.50	2NC1Y	5.22	0.25	0.00	0.20	1.48	0.00	0.00	-0.01	0.00	0.01	0.00	0.00	-0.36
3NC3M	5.26	0.33	0.00	0.30	0.77	3NC3M	5.49	0.56	-0.02	0.54	0.48	0.23	0.00	0.00	-0.02	0.26	0.22	0.24	-0.89
3NC6M	5.31	0.38	0.00	0.36	0.59	3NC6M	5.43	0.50	-0.02	0.48	0.39	0.12	-0.01	-0.01	-0.02	0.16	0.11	0.13	-0.65
3NC1Y	5.31	0.38	0.02	0.35	0.87	3NC1Y	5.35	0.42	0.01	0.39	0.86	0.04	0.01	0.00	-0.01	0.05	0.03	0.04	-0.21

Source: RBSGC 10/27/06

Yield Enhancement: Lockout

- The pick up for shortening lockout protection (moving from a 1yr lockout to a 3M lockout) has compressed due to the flat curve and falling volatility.
- In Berms, the picks for shortening lockout are near the 3M averages. For example, the 3NC3m picks up 6 bp to the 3nc6M and the 3NC6m picks up 8 bp to the 3NC1y.
- If you expect falling rates, longer lockouts offer coupon protection. The shorter locks act like money market alternatives in falling rate environment.

Lockout Comparison									
1xs	Last	1Mo Chg	3M Avg	Z	Berms	Last	1Mo Chg	3M Avg	Z
2 Year					2 Year				
6M to 3M	-0.02	0.00	-0.04	0.24	6M to 3M	0.01	-0.01	0.01	-0.02
1Y to 6M	0.03	-0.02	0.06	-0.27	1Y to 6M	0.09	-0.02	0.09	-0.25
3 Year					3 Year				
6M to 3M	-0.05	0.00	-0.06	0.82	6M to 3M	0.06	0.00	0.05	0.81
1Y to 6M	0.00	0.02	-0.01	0.35	1Y to 6M	0.08	-0.03	0.09	-0.36

As of 10/27/06

TRR Outperformance Bands: Callables vs. Duration-Matched Bullets

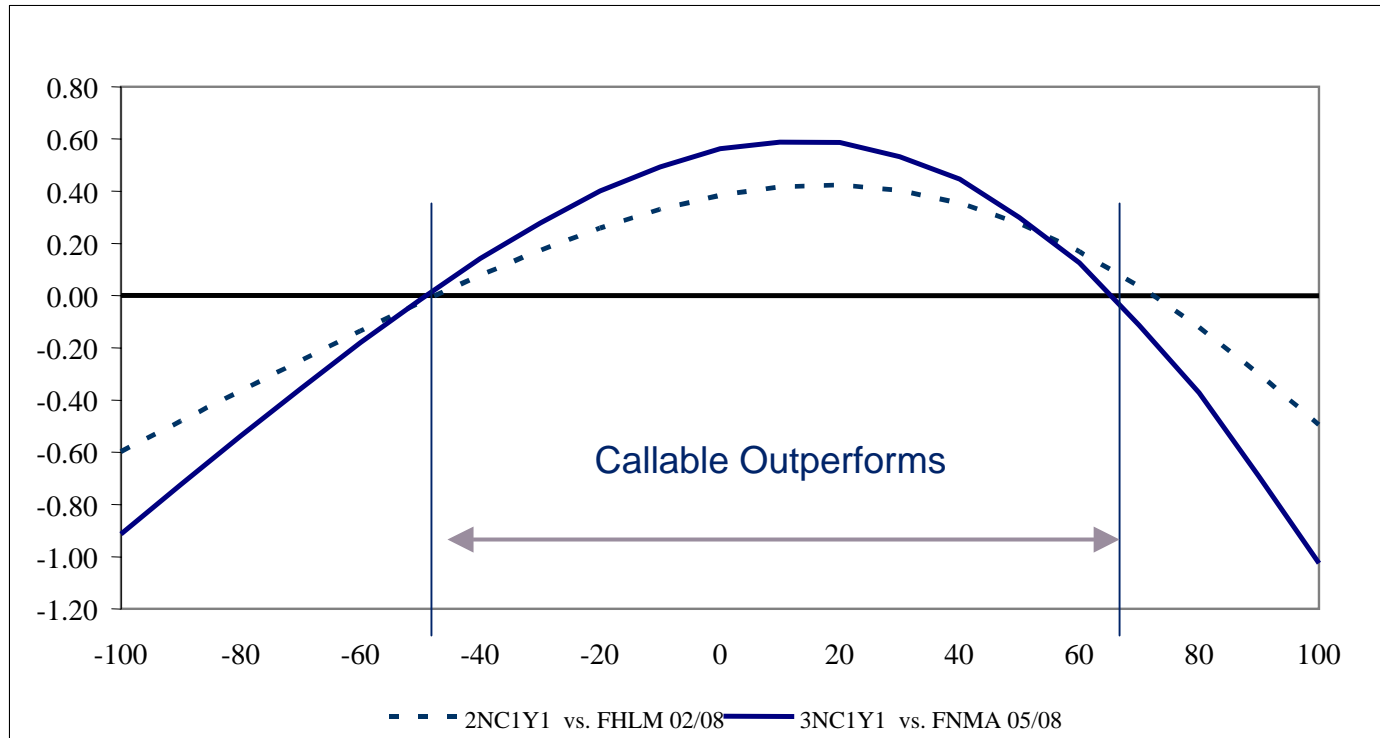
- The outperformance band is the interest rate range that the callable outperforms a similar duration bullet.

			TRR Immediate Shift in Interest Rates: 3M Horizon																				Outperformance Band				
Issue	Cpn	YTM	-100	-90	-80	-70	-60	-50	-40	-30	-20	-10	0	10	20	30	40	50	60	70	80	90	100	Last Lower Band	Last Upper Band	3M Median Lower Band	3M Median Upper Band
2NC1Y1	5.23	5.23	8.38	8.08	7.78	7.48	7.18	6.87	6.56	6.25	5.92	5.58	5.23	4.85	4.45	4.02	3.57	3.09	2.58	2.04	1.48	0.91	0.31				
FHLM	4.63	5.08	8.98	8.56	8.14	7.73	7.31	6.90	6.48	6.07	5.66	5.25	4.84	4.43	4.03	3.62	3.22	2.81	2.41	2.01	1.61	1.21	0.81				
Difference		0.15	-0.60	-0.48	-0.36	-0.25	-0.14	-0.03	0.08	0.17	0.26	0.33	0.38	0.42	0.42	0.40	0.35	0.28	0.17	0.04	-0.12	-0.30	-0.49	-40	70	-40	70
3NC1Y1	5.32	5.32	8.75	8.45	8.14	7.83	7.52	7.20	6.87	6.52	6.16	5.77	5.36	4.91	4.43	3.89	3.33	2.71	2.07	1.36	0.63	-0.16	-0.96				
FNMA	6.00	5.03	9.67	9.17	8.68	8.19	7.70	7.21	6.73	6.24	5.76	5.28	4.80	4.32	3.84	3.36	2.89	2.41	1.94	1.47	1.00	0.53	0.07				
Difference		0.29	-0.91	-0.72	-0.54	-0.36	-0.18	-0.01	0.14	0.28	0.40	0.49	0.56	0.59	0.59	0.53	0.45	0.30	0.13	-0.11	-0.37	-0.69	-1.03	-40	60	-50	60

Issue	Cpn	YTM	TRR Immediate Shift in Interest Rates: 3M Horizon			
			BearF 50	Bear S 50	BullF 50	BullS 50
2NC1Y1	5.23	5.23	2.97	5.31	5.15	7.06
FHLM	4.63	5.08	2.60	4.95	4.74	7.12
Difference		0.15	0.37	0.36	0.41	-0.06
3NC1Y1	5.32	5.32	2.75	5.37	5.33	7.37
FNMA	6.00	5.03	2.23	4.89	4.70	7.41
Difference		0.29	0.52	0.48	0.63	-0.04

TRR: Immediate parallel shift and twists in the on the run Tsy curve, 3 Month Horizon, Constant OAS at Horizon performed on the Tsy curve in Yield Book. 10/27/06.

TRR Graph: Callable vs. Duration-Matched Bullets

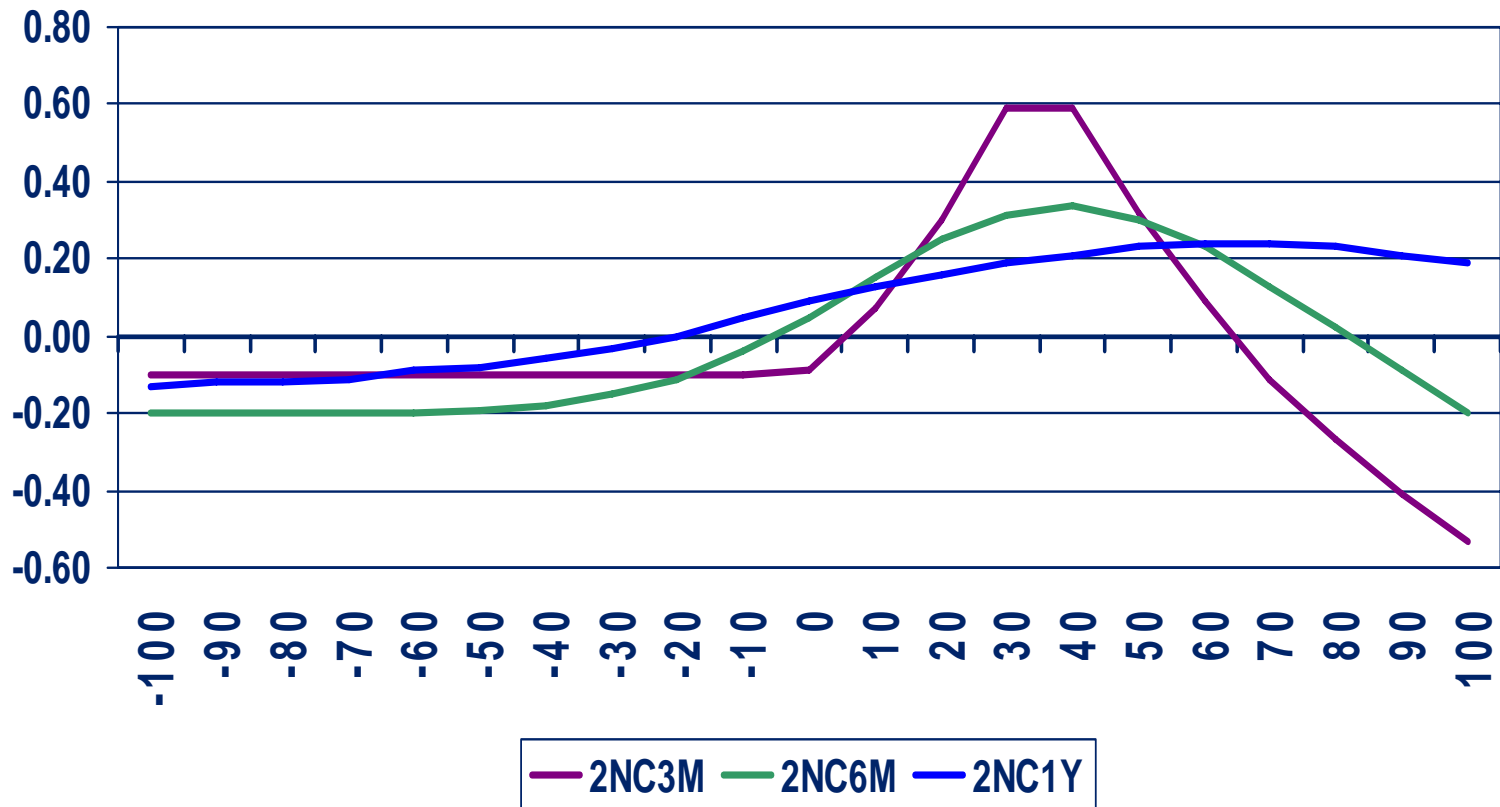


- The 2 NC1y (1x) and 3 NC 1y (1x) outperform a similar duration bullet when rates fall by up to 50 bp and rise by up to 50-60 bp.

TRR Difference: Berms vs. Euros

- Euros generally outperform Berms in a flattening curve (bull& bear) as well as a bull steepening.
- Berms: selling more valuable option generally protects the seller for a greater range in rates with greater protection in a falling interest rate environment.

TRR Comparison: Euros less Berms



- The Euros outperform when rates remain in range bound.
- The Berms outperform the Euros when rates fall and everything gets called because of the higher coupon.
- The Berms also tend outperform rates rise and nothing gets called because the higher coupon results in a lower duration.

AOAS Methodology

- Implemented in 2003 to standardize the pricing, quoting, and trading of 1x callables.
 - Increased the pricing transparency, and
 - Advanced the secondary market for callables.
- More accurately reflects the yield premium the investor earns for selling the embedded call option, credit risk, and interest rate risk of the security.
- AOAS uses a constant maturity agency yield curve that is issuer specific for FNMA and FHLMC and defaults to the swap curve for FHLB. For FNMA and FHLMC the spread to the appropriate bullet credit curve is calculated.
- AOAS uses a structure specific option model to evaluate a security.
 - The option value embedded in the price reflects the market value of the option relative to the swaptions market (through the use of Black's Model for swaptions.)
 - The AOAS uses the relevant skew-adjusted volatility to price the callables on an OAS basis. The volatility skew makes the volatility assumption for off-the-money (either out-of-the-money or in-the-money) callables consistent with the market volatility for off-the-money swaptions.

Interpreting the AOAS Screen

<HELP> for explanation.

P164 Corp **AOAS**

AGENCY OPTION-ADJUSTED SPREAD

FED HOME LN BANK FHLB 5 $\frac{3}{8}$ 10/09 99.9481/ 99.9481 (5.39/5.39) BFV @14:02

Calculate **Price** **OAS (bp)** Fwd ATM Skew Adj
(P,O,V) **P** (P) **100.044625** **0** **+ 1.00** Strike Vol Vol
Skew Adj Exp **1.00**
Cusip / ID# 3133XHLV2 Option Px Value: 1.21
Settle **10/31/2006** Bench settle **10/31/2006**
Spread **60.8bp** vs **2Y** **T 4 $\frac{3}{8}$ 10/31/08 Govt@100-7+** (**4.751**)

{NUM}<GO> for:
3) Call Schedule
10/30/ 7 100.00

	OAS Method	Option Free	To Call on 10/30/2007	To Mty
Yld		4.921	5.329	5.359
Sprd		1.1	21.1	44.9
M Dur	1.47		0.96	2.73
Risk	1.47		0.96	2.74
Cnvx	-0.84		0.01	0.09

Model **S** S=Black Swaption

*Curve Source **BBAG** Bloomberg Agency Composite

2) Customize
Curve **I267** Semi
BMA-FHLMC REFEREN
Dated **10/30/2006**
Settle 10/31/2006

A BMA CMT
Shift **+0(bps)**

*Yield Adjust

3m	5.237	0.3
6m	5.261	-0.1
1y	5.129	-1.2
2y	4.977	-1.1
3y	4.925	-1.5
4y	4.920	0.1
5y	4.946	0.6
7y	4.958	0.0
10y	5.017	0.1
20y	5.091	1.8
30y	5.164	3.6

88) REFRESH

Australia 61 2 9777 8600

Brazil 5511 3048 4500

Europe 44 20 7330 7500

Germany 49 69 920410

Hong Kong 852 2977 6000

Japan 81 3 3201 8900

Singapore 65 6212 1000

U.S. 1 212 318 2000

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AOAS as a Relative Value Tool

- AOAS can be used as a barometer of relative value along with other tools. It should not be used alone because just because 2 callables have an AOAS of 5 does not necessarily mean an investor is indifferent between the two.
- Must also factor in the price of bond, how far in or out of the money the bond is, and time remaining to call date.

Bond Comparison: Which is the better buy?

- Compare 2 old 3NC1y (1x) with same AOAS

	FHLMC 5.75 8/7/09	FHLB 5.375 10/30/09	Difference
Remaining Structure	2.75 NC 9M	3 NC1y (1x)	
Cusip	31359MU84	3133XHLV2	
Coupon	5.75	5.375	0.375
AOAS	3	3	0
Price	100.358	100.018	0.34
Call Date	8/07/07	10/30/07	
YTC	5.26	5.36	-0.10
YTM	5.61	5.37	0.24
YTC Pick to 1yr Bullet	9	24	-15
YTM Pick to 3yr Bullet	68	46	22
Duration	0.92	1.48	-0.56
Effective Convexity	-0.58	-0.84	0.26

Two Bonds: Different Probability of Call

- How far is each bond in/out of the money at the call date?

	FHLMC 5.75 8/7/09	FHLB 5.375 10/30/09	Difference
Structure	3 NC1y (1x)	3 NC1y (1x)	
Structure at Call Date	2 yr bullet	2 yr bullet	
Current Bullet	5.00 (FN 8/08)	4.97 (FN 10/08)	0.03
Forward Strike	4.83	4.80	0.03
Rate Change Implied by Fwds	-0.17	-0.17	0
Coupon	5.75	5.375	0.375
In/Out Money vs. Current	75 bp IN	40.5 BP IN	0.345
Out/Money vs. Fwds	92 BP IN	57.5 BP IN	0.345

Two Bonds: Different Probability of Call

- Although both bonds are 3 NC1y (1x)s with the same AOAS, the investor would not be indifferent between the two.
- The first bond has a higher probability of call as its coupon is 34.5 bp higher than the second bond.
 - This issue is 92 bp in the money to be called versus the market's expectation for interest rates on the call date.
 - The high probability of call results in a lower pick up to call because there is less uncertainty. In this case, the investor expects to earn the YTC of 5.26%, which picks up of 9 bp to the 8/07 bullet.
- The second bond is 57.5 bp in the money to be called with a YTC of 5.36%, which is 10 bp higher than the first bond.
 - The YTC pick up versus the 10/07 bullet is 24 bp, which is 15 bp more than the YTC pick of the first bond.
 - The added yield is compensation for the uncertainty surrounding call, for the negative convexity.

Which bond is the better buy?

- The 2 bonds have different call characteristics.
- The best bond will depend on the investor's expectations for interest rates.
- **Buy the 1st bond if:**
 - This bond is considered a 1yr bullet alternative. Buy this issue if you want a higher degree of certainty that you will have a 1yr bullet at a pick up of 9 bp.
 - Expect rates to rise enough for the bond not to be called, resulting in the high YTM of 5.605%. The forwards would need to rise by 92 bp for this issue not to be called. This outcome is a lower probability event.
 - If you expected rates to rise slightly or fall, you would buy the first bond as it has a higher YTC.
- **Buy the 2nd bond if:**
 - Expect rates to rise slightly or fall, resulting in the more attractive YTC of 5.356.

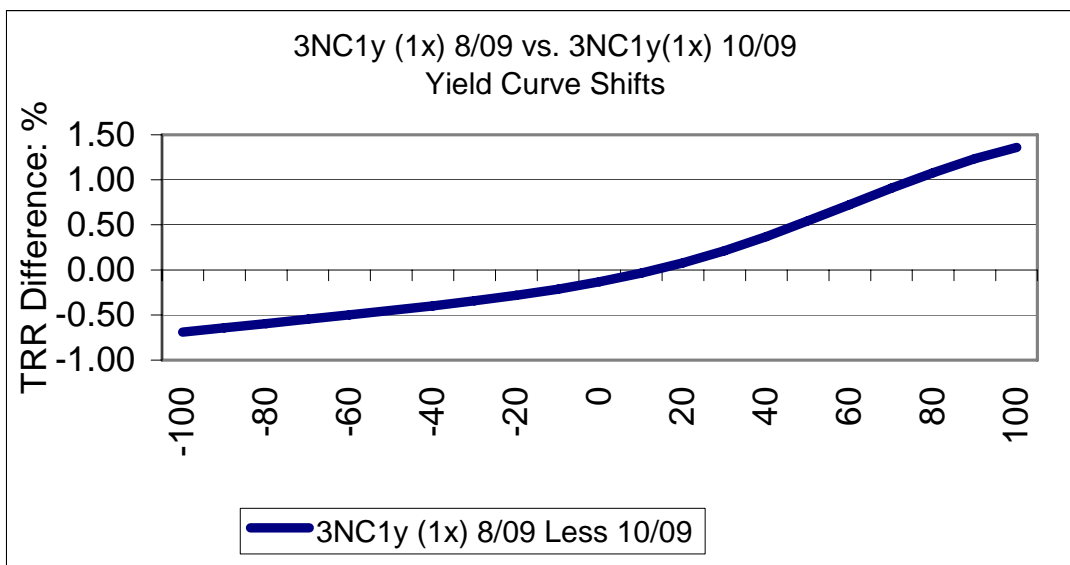
TRR Comparison

The 3 NC1y (1x) 8/09 outperforms the 10/09 callable when interest rates rise by 20 bp or more and in the bear flattener. The 10/09s outperform when rates rise by up to 10 bp or fall and in the remaining twist scenarios.

When rates fall by more than 20 bp, the longer duration of the lower coupon bond results in greater price depreciation. When rates fall, the longer duration bond outperforms.

Annualized Total Rate of Return: 6M Horizon

	-100	-50	-20	-10	0	10	20	50	60	70	80	90	100
3NC1y (1x) 8/09	5.72	5.45	5.29	5.24	5.19	5.13	5.08	4.87	4.77	4.64	4.47	4.27	4.01
3NC1y(1x) 10/09	6.41	5.90	5.57	5.45	5.32	5.17	5.00	4.33	4.05	3.74	3.40	3.03	2.65
1yr lock Call vs. 2yr	-0.69	-0.45	-0.28	-0.21	-0.13	-0.04	0.08	0.55	0.72	0.91	1.08	1.24	1.36



	Bear F	BullS	BearS	BullF
3NC1y (1x) 8/09	4.83	5.50	5.21	5.16
3NC1y(1x) 10/09	4.31	5.98	5.34	5.29
1yr lock Call vs. 2yr	0.52	-0.48	-0.13	-0.13

TRR: Immediate parallel shift and twists in the off the run Tsy curve, 6 Month Horizon, Constant OAS at Horizon. Interest Rate Twists are 50 bp 2s to 30s, 25 bp 2s to 10s, and 10 bps 2s to 5s performed on the Treasury curve in Yield Book.

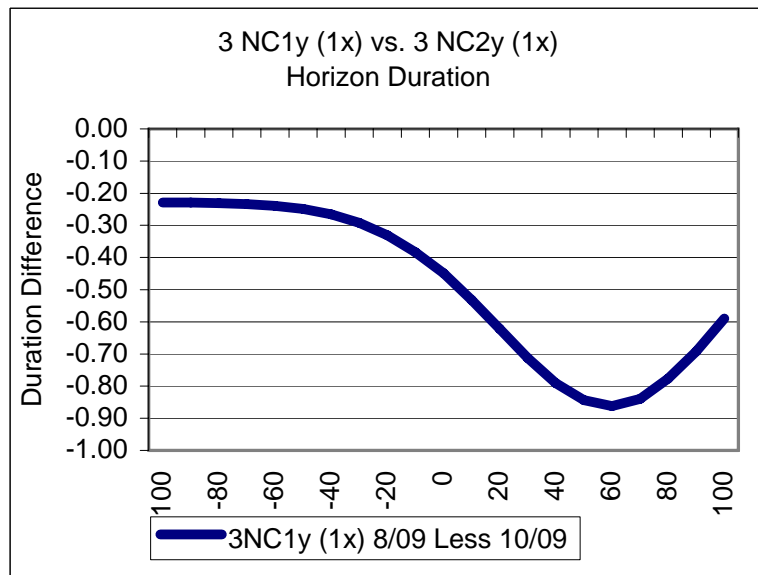
6M Horizon Duration

In 6M, the 8/09 will have 3M remaining to the call date. The horizon duration is much lower than the 10/09s in the rising rate scenarios.

The 10/09s will have 5M remaining to the call date, resulting in a higher duration in the falling rate scenarios.

Effective Duration at 6M Horizon

	-100	-50	-40	-30	-20	-10	0	10	20	30	40	50	60	70	80	90	100
3NC1y (1x) 8/09	0.27	0.27	0.27	0.27	0.27	0.27	0.28	0.29	0.31	0.34	0.40	0.49	0.62	0.78	0.98	1.18	1.38
3NC1y(1x) 10/09	0.50	0.52	0.54	0.56	0.60	0.66	0.73	0.82	0.93	1.05	1.19	1.34	1.48	1.62	1.76	1.87	1.97
1yr lock Call vs. 2yr	-0.23	-0.25	-0.27	-0.29	-0.33	-0.38	-0.45	-0.53	-0.62	-0.71	-0.79	-0.84	-0.86	-0.84	-0.78	-0.69	-0.59



	Bear F	BullS	BearS	BullF
3NC1y (1x) 8/09	0.47	0.27	0.28	0.28
3NC1y(1x) 10/09	1.27	0.53	0.76	0.70
1yr lock Call vs. 2yr	-0.81	-0.26	-0.48	-0.42

TRR: Immediate parallel shift and twists in the off the run Tsy curve, 6 Month Horizon, Constant OAS at Horizon. Interest Rate Twists are 50 bp 2s to 30s, 25 bp 2s to 10s, and 10 bps 2s to 5s performed on the Treasury curve in Yield Book.

How do we analyze one callable?

- 3 NC1y (1x) with a coupon of 5.375%
 - Final maturity = 3 years
 - Callable one time
 - Investor is compensated for selling the embedded call option in the form of added yield.
 - YTM is 46 bp greater than the 3yr agency bullet versus a 3M average pick up of 36 bp.
 - Callable picks up 33 bp versus a similar duration bullet (4/08 sector). The 3M average pick up is 28 bp.
 - 2yr agy 1yr forward=4.80%, so the bond is 57.5 bp in the money vs. the forwards.
 - Current Rates: Breakevens staying short vs. extending = -27 to +52bp
 - Forward Rates: Breakevens staying short vs. extending = -10 to +69bp
- Breakeven vs. similar duration bullet = -70 to +80bp

Market at time of Analysis

Current Bullet Rates	Yield
10/07 agy	5.13% BEY
10/08 agy	4.97%
10/09 agy	4.92%
3yr Tsy	4.69%
2yr 1yr Fwd	4.80%

	Agy Spot Rates 10/30/06	1yr Forward at 1st Call date (10/30/07)	12M Change in Rates
1yr	5.13	4.80	-32
2 yr	4.97	4.80	-17

10/30/06

Forward Rates

- The forward rates are an indication of market expectations for interest rates and are based on current rates.
- For example, if the 1yr agy rate today is 5.13% and 2yr agy rate is 4.965%, then the 1yr agy rate 1 yr forward is 4.80%.
- Therefore, if the forwards are realized, the investor is indifferent between rolling 1yr agencies and buying a 2yr agy.
- In this example, the forward rates are 33 bp lower than current rates. Therefore, 1yr rates would have to fall by less than this for the strategy of rolling 1yr agency bullets to outperform. If rates fall by more, the 2-year bullet would have been the best investment.

How Are Forward Rates Calculated?

- The forward curve can be obtained using Bloomberg FWCV <go> 27 <go> FMC#84 for the agency curve.
- The forwards are calculated using the following formula:

$$\text{Forward}_{m,n} = [(1 + R_{m+n})^{m+n} / (1 + R_n)^n]^{1/m} - 1$$

R = rate

m = forward rate

n = periods forward

- In this example, we are solving for the 1year rate, 1year forwards.

$$\text{Forward}_{1,1} = [(1 + R_{1+1})^{1+1} / (1 + R_1)^1]^{1/1} - 1$$

$$\text{Forward}_{1,1} = [(1 + R_2)^2 / (1 + R_1)] - 1$$

$$\begin{aligned}\text{Forward}_{1,1} &= [(1+0.04965)^2 / (1+0.0513)] - 1 \\ &= (1.1018/1.0513) - 1 \\ &= 4.80\%\end{aligned}$$

Falling Rates: Reinvestment Risk

- If the bond is called at its only call date, the proceeds from call must be reinvested for the remaining 2 years of the original 3yr horizon.
- In this case, the investor would earn the YTC for one year and then the yield on a 2yr bullet.
- We need to calculate the 2yr rate needed at the call date in 1yr to breakeven to having bought the 3yr bullet.

$$\text{YTC} = 5.368$$

$$\text{3yr bullet} = 4.92\%$$

$$5.368 (1/3) + 2/3x = 4.92$$

$$x = 4.70\%$$

- The minimum reinvestment rate is 4.70% for the remaining 2yrs. This is 27 bp lower than the 2yr bullet rate (4.97%) and 10 bp lower than the 2yr rate projected by the forwards at the reinvestment date (4.80%).
- This is the amount that current rates and forward rates can fall by and the investor is still better off buying the 3 NC 1y (1x) to the call date and then reinvesting in a 2yr agy bullet versus having bought the 3yr bullet.

Rising Rates: Sustainable Breakeven

- Those who expect interest rates to increase will be interested in the breakeven between rolling 1yr agency bullet into a 2yr bullet and buying the 3 NC1y (1x) if it is not called.

$$\text{YTM} = 5.368$$

$$1\text{yr bullet} = 5.12\%$$

$$5.12 (1/3) + 2/3x = 5.368$$

$$x = 5.49\%$$

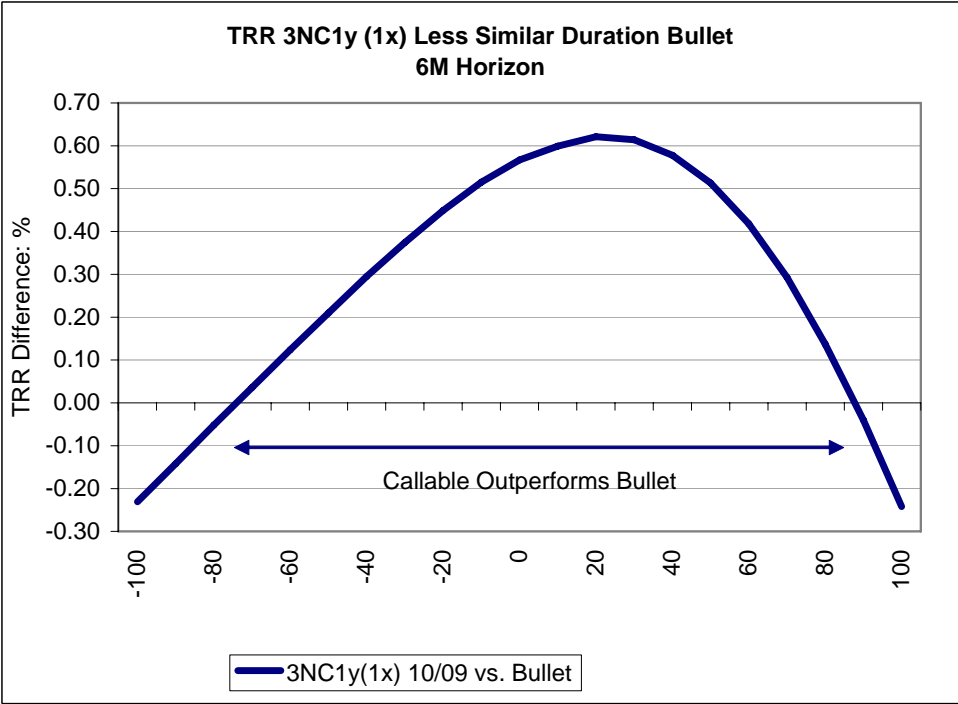
- The 2yr rate 1yr from now must be at least 5.92% for rolling a 1yr bullet into a 2yr bullet to be a better investment than the 3 NC1y (1x) if it is not called.
- This is 69 bp more than the rate projected by the forward curve (4.80%) or 52 bp higher than the current 2yr rate (4.97%).

TRR Comparison

3 NC 1yr (1x) vs. Similar Duration Bullet

Structure	Issue	Coupon	Price	YTM	Effective Duration	Effective Convexity
3 NC1y (1x)	New	5.375	100.06	5.35	1.41	-0.65
Bullet	FHLMC 2/21/08	4.625	99.2	5.03	1.40	+0.03

TRR Comparison: Parallel Shift in Tsy Curve

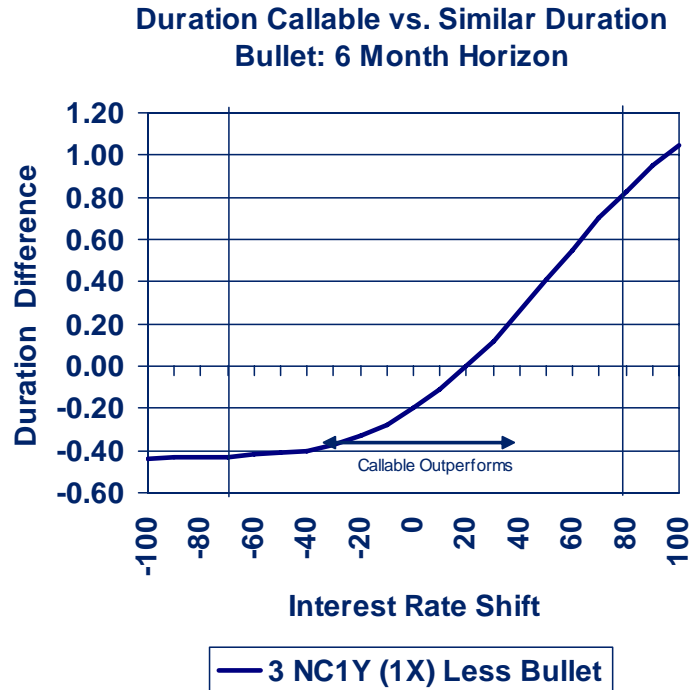


TRR Comparison: 6M Horizon					
	-100	-50	0	+50	+100
3 NC1y (1x)	6.41	5.90	5.32	4.33	2.65
FH 4/08	6.64	5.50	4.75	3.82	2.89
Difference	-0.23	0.21	0.57	0.51	-0.24

The callable outperforms a similar duration bullet over a wide range of interest rates of -70 bp to +80 bp.

Analysis is immediate parallel shift, 6M horizon, calculated on Yield Book as of 8/21/06 using the U.S. Tsy Curve.

Duration Comparison: Parallel Shift in Tsy Curve



Duration Comparison: 6M Horizon					
	-100	-50	0	+50	+100
3 NC1y (1x)	.050	0.52	0.73	1.34	1.97
FHL 4/08	0.94	0.93	0.93	0.93	0.93
Difference	-0.44	-0.41	-0.20	0.41	1.05

When interest rates increase, the duration of the callable extends, which results in the callable underperforming the bullet when rates increase by more than 80 bp.

Summary

- Callable agencies outperform similar duration bullets when rates remain range bound. This should be the case if the Fed is on hold for some time.
- Choose issues that offer yield enhancement, wide outperformance bands that fit with your interest rate outlook and cash flow needs.
- Diversification in call lockout and frequency is key to reduce reinvestment risk and extension risk.
- At this time, most new issues are in the money to be called versus the market's expectation for interest rates. Those who are looking for discount note alternatives will prefer shorter lockout paper, but some of these issues have narrow spread picks to the call date, which limits the upside.
- We prefer longer lockouts in order to protect against call in the event the market reprices a Fed easing scenario in 2007.

Case Study Instructions

- Compare two bonds in the 2yr sector. Both are 1x callables with different lockouts.
- Calculate the amount in/out of the money.
- Calculate breakevens versus current rates and the forward curve.
- Determine which is the better buy based on yield enhancement, probability of call, reinvestment risk. Overlay interest rate expectations.

Callable Comparison

- 2 NC 1y (1x) FHLB 5.35 11/13/08 – 11/13/07 (1x) at 3 AOAS 100.08
- 2 NC6M (1x) FHLB 5.25 11/13/08 – 05/13/07 (1x) at PAR

2 NC1y (1x): FHLB 5.35 11/13/08 – 11/13/07

1yr Rate 1yr Forward. Compare to cpn to determine in/out of the money.

AOAS

<HELP> for explanation.

P164 Corp AOAS

Price

AGENCY OPTION-ADJUSTED SPREAD

FED HOME LN BANK FHLB 5.35 08-07 100.0441/100.0441 (5.30/5.30) BFV @16:04

Calculate (P,O,V) P	Price 100.0837	OAS (bp) 0) + 3.00	Strike 4.837	Vol 16.35	Vol 15.55
			Skew Adj Exp 1.00		
Cusip / ID# 3133XHMU3	Option Px Value: 0.58				
Settle 11/13/2006	Bench settle 10/31/2006				
Spread 55.5bp vs 2Y T 4 % 10/31/08 Govt @ 100-7+ (4.751)					

2) Customize

Curve **I267** Semi

BMA-FHLMC REFEREN

Dated **10/30/2006**

Settle **11/13/2006**

A BMA CMT

Shift **+0(bps)**

*Yield Adjust

3m	5.237	0.3
6m	5.262	-0.1
1y	5.128	-1.2
2y	4.975	-1.0
3y	4.926	-1.4
4y	4.921	0.1
5y	4.945	0.6
7y	4.957	0.0
10y	5.017	0.1
20y	5.092	1.8
30y	5.166	3.6

88) REFRESH

{NUM}<GO> for:
3) Call Schedule
11/13/ 7 100.00

	OAS Method	Option Free	To Call on 11/13/2007	To Mty
Yld		4.995	5.263	5.305
Sprd		3.1	14.7	34.1
M Dur	1.24		0.96	1.87
Risk	1.25		0.96	1.88
Cnvx	-0.43		0.01	0.05

Model **S** S=Black Swaption

*Curve Source **BBAG** Bloomberg Agency Composite

Australia 61 2 9777 8600 Brazil 5511 3048 4500 Europe 44 20 7330 7500 Germany 49 69 920410
Hong Kong 852 2977 6000 Japan 81 3 3201 8900 Singapore 65 6212 1000 U.S. 1 212 318 2000 Copyright 2006 Bloomberg L.P.
6470-946-1 30-Oct-2006 16:09:19

Call Date

Effective Duration and Convexity

Yield to Call and pick up to 1yr bullet

Yield to Maturity and pick up to 2yr bullet

2 NC6M (1x): FHLB 5.32 11/10/08-05/10/07 (1x)

<HELP> for explanation.

P164 Corp **AOAS**

AGENCY OPTION-ADJUSTED SPREAD

FED HOME LN BANK .FHLB 5.32 11/08 99.8834/ 99.8834 (5.38/5.38) BFV @ 9:19

Calculate **Price** **OAS (bp)** Fwd ATM Skew Adj
 (P,O,V) ☐ P) **100.0000** **0** **-2.29** Strike Vol Vol
 4.782 **14.13** 13.39
 Skew Adj Exp **1.00**
 Cusip / ID# PP4K0AUH8 Option Px Value: 0.79
 Settle **11/10/2006** Bench settle **11/ 2/2006**
 Spread **19.4bp** vs **5MO** **B 0 04/26/07 Govt** @ **4.93** (**5.126**)

{NUM}<GO> for:
 3) Call Schedule
 5/10/ 7 100.00

	OAS	Option	To Call on	To
	Method	Free	5/10/2007	Mty
Yld		4.899	5.320	5.320
Sprd		-2.2	6.6	39.9
M Dur	0.70		0.49	1.87
Risk	0.70		0.49	1.87
Cnvx	-0.75		0.00	0.05

Model **S** S=Black Swaption

*Curve Source **BBAG** Bloomberg Agency Composite

2) Customize
 Curve **I267** Semi
 BMA-FHLMC REFEREN
 Dated **10/31/2006**
 Settle 11/10/2006

A BMA CMT
 Shift **+0(bps)**

*Yield Adjust

3m	5.235	0.0
6m	5.255	-0.1
1y	5.113	-1.4
2y	4.935	-1.4
3y	4.874	-1.4
4y	4.879	0.1
5y	4.901	0.6
7y	4.922	0.0
10y	4.977	0.1
20y	5.050	1.9
30y	5.124	3.7

88) REFRESH

Australia 61 2 9777 8600
 Hong Kong 852 2977 6000

Brazil 5511 3048 4500

Europe 44 20 7330 7500

Germany 49 69 920410

Japan 81 3 3201 8900 Singapore 65 6212 1000 U.S. 1 212 318 2000 Copyright 2006 Bloomberg L.P.
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Callable Comparison: Fill in the Table

Structure	2 NC1y (1x)	2 NC6M (1x)	Difference
Issue	FHLB 5.35 11/13/08 – 11/13/07	FHLB 5.32 11/10/08/5/10/07	
Price			
AOAS			
Coupon			
Edur			
Econv			
YTC			
YTM			
YTC Pick vs. Bullet			
YTM Pick vs. Bullet			
Forwards at Call Date			
Fwds vs. Cpn			
Bps In/Out of the Money			
Breakeven: Falling Rates			
Breakeven: Rising Rates			

Breakeven Calculation #1: 2 NC1y (1x)

- For investors who fear falling rates, how much can rates fall before you would have been better off buying a 2yr bullet vs. buying the 2NC1y (1x) to the call date and reinvesting the proceeds for the remaining 1yr?

1yr bullet: 11/07 bullet = 5.12%

2yr bullet: 11/08 bullet = 4.97%

YTC of callable = 5.23%

1yr Bullet, 1yr Forward = 4.86%

1. Calculate the breakeven: **$YTC (1/2) + 1/2x = 2yr \text{ Bullet Rate}$**

(This is the minimum reinvestment rate needed at the call date to breakeven to having bought the 2yr bullet instead of the callable.)

2. Compare x with current 1yr bullet rate. This is the amount that rates can fall before you would have been better off buying the 2yr bullet. **$X - 1yr \text{ bullet rate} = ?$**

- Compare x with 1yr bullet forward rate at the call date. This is the amount that the forwards can fall by before you would have been better off extending today into the 2yr bullet.

$X - 1yr \text{ bullet } 1yr \text{ forward} = ?$

- Do you agree with the market's expectations for interest rates?

Breakeven Calculation #1a: 2 NC1y (1x)

- For investors who fear rising rates, how much can current interest rates and forward interest rates increase before you would have been better off rolling a 1yr agency bullet into another 1yr agency bullet versus buying the 2NC1y (1x) YTM today?

11/07 bullet = 5.12

11/08 bullet = 4.97

YTM of callable = 5.305

1. Calculate the breakeven: **1yr bullet rate(1/2) + 1/2x = YTM of Callable**

(This is the minimum reinvestment rate needed in 1yr for the remaining year to breakeven to having bought the callable if it is not called.)

2. Compare x with current 1yr bullet rate. This is the amount that rates can rise by before you would have been better off rolling a 1yr bullet into another 1yr bullet. **X – 1yr bullet rate = ?**

3. Compare x with 1yr bullet rate 1yr forward at the call date. This is the amount that the forwards can rise by before you would have been better staying short in a 1yr bullet and rolling into another 1yr bullet versus extending in the callable YTM.

X – 1yr bullet 1yr forward = ?

4. Do you agree with the market's expectations for interest rates?

Breakeven Calculation #2: 2 NC6M (1x)

- For investors who fear falling rates, how much can rates fall before you would have been better off buying a 2yr bullet vs. buying the 2NC6M (1x) to the call date and reinvesting the proceeds for the remaining 1.5yrs?

6M: 5/07 bullet = 5.26

1.5Y: 5/08 bullet = 5.04

2Y: 11/08 bullet = 4.97

YTC of callable = 5.32

1.5yr Bullet Fwd at Call date = 4.86%

1. Calculate the breakeven: $YTC(1/4) + 3/4x = 2\text{yr bullet}$

2. Compare the breakeven with the current 1.5yr bullet rate and the 1.5yr bullet rate projected at the call date. This is the amount that rates can fall before you would have been better off buying the 2yr bullet.

$X - 1.5\text{yr bullet rate} = ?$

$X - 1.5\text{yr bullet 1yr forward} = ?$

Breakeven Calculation #2a: 2 NC6M (1x)

- For investors who fear rising rates, how much can current interest rates and forward interest rates increase before you would have been better off rolling a 6M bullet into a 1.5yr agency bullet versus buying the 2NC6M (1x) today?

6M: 5/07 bullet = 5.26

1.5Y: 5/08 bullet = 5.04

2Y: 11/08 bullet = 4.97

YTM of callable = 5.32

1.5yr Bullet Fwd at Call date = 4.86%

- Calculate the breakeven: $6M\text{ bullet}(1/4) + 3/4x = YTM\text{ Callable}$*
- Compare the breakeven with the current 1.5yr bullet rate and the 1.5yr bullet rate projected at the call date. This is the amount that rates can rise by before you would have been better off rolling the 6M into a 2yr.*
 $X - 1.5yr\text{ bullet rate} = ?$
 $X - 1.5yr\text{ bullet } 1yr\text{ forward} = ?$

Agy Forward Curves

- 6M lockout call date is 5/10/07. Bond will have 1.5yr remaining. Estimate the 1.5yr 6 months forward. $[(4.89 + 4.89)/2 = 4.89]$
- 1yr lockout call date is 10/30/07. Bond will have 1yr remaining. The 1yr agency 1yr forward = 4.86%

<HELP> for explanation.

P164 Corp FWCV



FORWARD CURVE ANALYSIS USD Govt Agency

BASE CURVE DEFAULTS - BGN
 Curve Dated: 10/31/06
 Settlement Date: 11/ 2/06
 Coupon/Spot: C
 Bid/Ask/Mid: B
 FMC #84 or SWDF #

TERM	YIELD	5/10/07	11/13/07	11/ 2/07
1 Wk	5.3822	4.9850 R	4.8671 R	4.8754 R
1 Mo	5.3822	4.9573 O	4.8661 O	4.8743 O
2 Mo	5.3822	4.9252 J	4.8646 J	4.8729 J
3 Mo	5.3822	4.8908 E	4.8632 E	4.8714 E
4 Mo	5.3743	4.8565 C	4.8619 C	4.8701 C
5 Mo	5.3656	4.8233 T	4.8604 T	4.8687 T
6 Mo	5.3572	4.8091 E	4.8591 E	4.8674 E
9 Mo	5.2525	4.8662 D	4.8549 D	4.8631 D
1 Yr	5.1477	4.8934	4.8567	4.8589
2 Yr	5.0213	4.8906	4.8958	4.8979
3 Yr	4.9880	4.8855	4.8771	4.8767
4 Yr	4.9516	4.8955	4.9153	4.9150
5 Yr	4.9679	4.9259	4.9426	4.9424
7 Yr	4.9904	4.9598	4.9732	4.9737
10Yr	4.9966	5.0012	5.0400	5.0381
15Yr	5.1935	5.1865	5.2034	5.2027
20Yr	5.1938	5.1847	5.1951	5.1947
30Yr	5.1844	n/a	n/a	n/a

- 1 GO Graph
- 2 GO Update Curve
- 3 GO Forwards Analysis

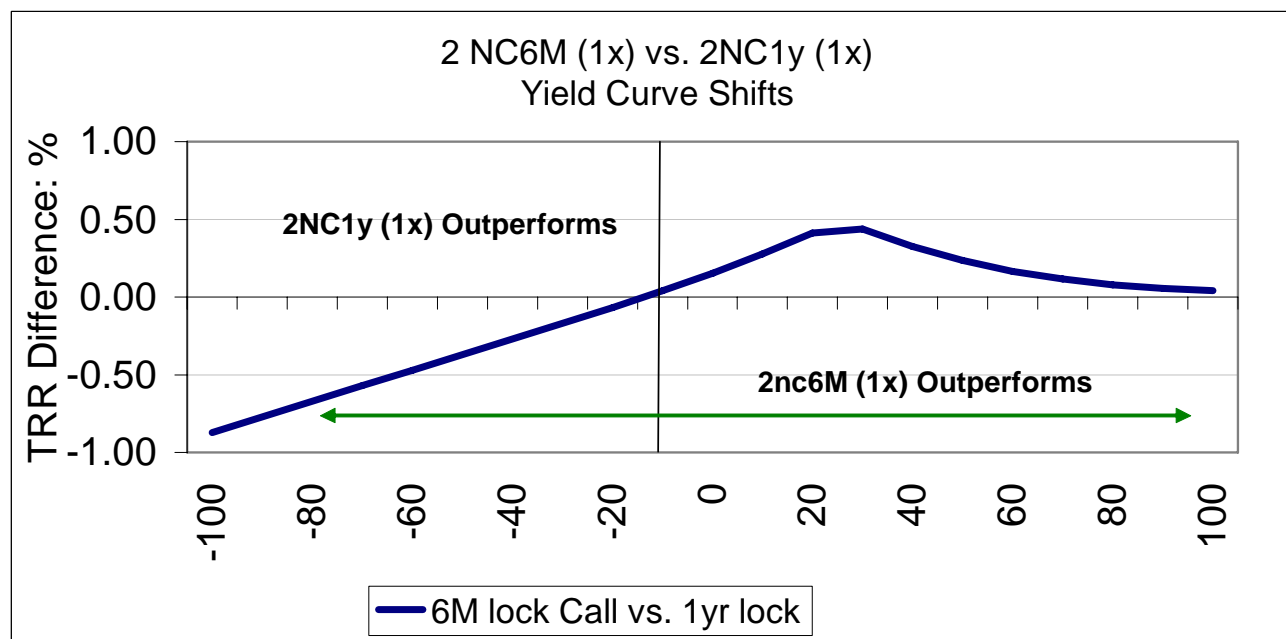
1yr and 2yr agency
6 months forward

1yr agency 1 yr
forward

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 Hong Kong 852 2977 6000 Japan 81 3 3201 8900 Singapore 65 6212 1000 U.S. 1 212 318 2000 Copyright 2006 Bloomberg L.P.
 6470-946-2 31-Oct-2006 08:18:29

How do the bonds compare on TRR basis?

- The longer duration 2 NC 1y (1x) outperforms when rates fall by 20 bp or more as the longer lockout offers more protection from call, delaying the reinvestment at the lower rates.
- The higher yield of the 2 NC6M (1x) results in outperformance when rates stay the same or fall by up to 10 bp as the higher coupon offsets the reinvestment risk.
- The 2 NC6M (1x) also outperforms when interest rates rise slightly as the bond has a high probability of allowing investors to reinvest at a higher rate. The 2NC6M (1x) also outperforms when neither bond gets called as the higher yield results in a lower duration.



Which bond do you prefer and why?

- 2 NC 1y (1x) FHLB 5.35 11/13/08 – 11/13/07 (1x) at 3 AOAS 100.08
- 2 NC6M (1x) FHLB 5.25 11/13/08 – 05/13/07 (1x) at PAR

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